PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

February 5.—Edward Forster, Esq., V. P., in the Chair.

Read, a paper entitled "A Note upon the Anatomy of the Roots of *Ophrydeæ*." By John Lindley, Ph. D., F.R. and L.S., Prof. Bot. University College.

The object of the author in this paper was to show that salep, the prepared roots of certain *Ophrydeæ*, is not a substance consisting principally of starch, as is the common opinion among writers of the present day, but is composed of a bassorine-like matter, organized in a peculiar manner.

After stating the opinions of recent authorities, the author gives the results of his own microscopical examination of the tissue of recent and prepared roots, by which it appears that the tubercles of *Ophrydeæ* universally contain large cartilaginous nodules of a mucilaginous substance, not coloured by iodine, and a small quantity of the grains of starch, lying in the usual manner in the parenchyma which surround the nodules, and readily susceptible to the usual action of iodine. The tubercles of many South-African *Ophrydeæ* present when dried the appearance of bags filled with small pebbles, as if the epidermis had contracted over hard bodies in the inside. If a fresh root of *Satyrium pallidum* be divided transversely the cause of this appearance is explained, for with its soft parenchyma are mixed tough nodules, clear as water, and often twenty times as large as the cells which surround them. These nodules are easily separable, are tough like horn, and on being sliced appear to be perfectly homogeneous. They are scarcely soluble in cold water; when boiled they become tumid and partially dissolve into a transparent jelly. If exposed to the air they rapidly dry and become brown. The aqueous solution of iodine has no sensible effect upon them in their natural state.

On charring slices of some salep procured at Covent Garden, a coarse preparation of wild *Ophrydeæ*, the author found that the nodules apparently homogeneous were composed of extremely minute transparent cells, filled, as he supposed, with a secretion of the same refractive power as themselves, and adhering naturally to each other firmly; the double walls of the cells and intercellular spaces being only made apparent by the charring process. The author explains the error of those who have considered salep to consist chiefly of starch, by allusion to the mode of its preparation. The tubercles

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The author commences his paper with the observation, that it was the lot of Mr. Brown to become connected in an almost exclusive way with the Flora of New Holland, he having been the first to illustrate its vegetable riches in an extensive and philosophic manner. Notwithstanding the important discoveries since made, his remarks, and especially those upon the botanical geography of that country, (published nearly twenty years ago,) have been confirmed by subsequent observations. The great approximation towards the European Flora, in that part of the country first explored by the author, agrees perfectly with the following observation of Mr. Brown: "It appears that a much greater proportion of the *peculiarities* of the Australian Flora exist in this, which I have therefore called the *principal parallel* (between 33° and 35° S. latitude), and that many of them are nearly confined to it.*" The author proposes the following geographical division of the Flora of the south-eastern part of New Holland.

1st. *The coast vegetation.*—This class of vegetation clothes the almost moveable sand of the coast, and the rocks of sandstone of the coal formation, or skirts the ponds of salt or brackish water. *Epacris, Boronia, Lambertia, Astroloma, Xanthorrhœa, Hakea, Banksia,* &c. are the most characteristic genera, forming usually a dense shrubbery of stiff and harsh plants. Of trees, scarcely any but species of *Eucalyptus* are to be met with.

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Read, "Extracts from Letters addressed to Dr. Royle, V.P.R. & F.L.S., Prof. Mat. Med., King's College." By Dr. Falconer, Superintendent of the Hon. E. I. C.'s Garden, Saharunpore.

Under date of January 24, 1837, from Saharunpore, Dr. Falconer gives a general report of the state of the garden.

"The *Bixa Orellana*," he remarks, "now flowers and fruits freely.

* According to a recent calculation, made from the degree of temperature at which water boiled on the top of this mountain (viz. 196°), it possesses an absolute height of 8000 feet, being by far the highest point reached hitherto by any traveller in Australia.

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The umbelliferous flowered *Panax*, near the cinnamon tree, is now a large and lofty tree, and there are numbers of it all over the garden. The Bombay Mangoes and Leechees are abundant with us. The medicinal garden still gives the annual supply of Hyoscyamus, and the Canal nursery turns out about 2000 teaks. The Otaheite sugar cane, brought up by Colvin, is likely soon to spread all over the district; it has succeeded famously here, and I have now in preparation about a couple of beegahs of ground outside the garden for it. I am also preparing for sowing about twenty beegahs with upland Georgia cotton seed, which will undoubtedly be most successful; it ripens before the Bourbon cotton comes into flower. This last season I got a few pods of Egyptian cotton, of the garden growth; the seed only reached me on the 15th of July, six weeks at the least too late, and it did not all ripen before the frosts, but what did ripen was long, fine, and strong in the staple, and the pods large. I expect to have a better account of it at the end of this season. I have also some Peruvian seed to experiment on.

"The herbarium has been largely added to. The family of all others that has yielded most additions perhaps is the *Orchideæ*. There are upwards of thirty epiphytous species growing on the trees in the garden, and many more in the herbarium; some of them are most interesting additions: one of them is a triandrous *Dendrobium*, *D. normale*, Fal. The three anthers are not the only singularity about it. The flower is perfectly regular; the three sepals being exactly equal, as are also the three petals, which, although of the same length, are twice as broad as the sepals. The column is also symmetrical; and as there is no labellum, it is difficult when the flower is removed from the axis to find out which of the petals represents the lip. Further, and what is most interesting of all, it clearly shows what is the normal position of the supplementary anthers in the family. Lindley makes them alternate with the lateral petals; while Brown, from the structure of *Apostasia* and *Cypripedium*, states that they alternate with the lateral sepals, and belong to a different whorl from the fertile anther. In my plant it is most distinctly evident, both by a decurrent ridge on each filament and by transverse sections of the column at all heights down to its base, that the supplementary anthers have the same relative position as the usual fertile one, and in harmony with Lindley's formula. Further, I have another variety of the species, in which the column is sliced off in front as is usual in the genus, and then the labellar petal is invariably developed into a spurred lip, so that it would appear that in the family the irregularity of the lip is a state

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ZOOLOGICAL SOCIETY.

July 24, 1838.—Thomas Bell, Esq., in the Chair.

A letter, addressed to the Secretary, was read, from Walter Paton, Esq., accompanying a donation to the Museum of an Indian Fowl, remarkable for having had one of its spurs engrafted upon its head. The spur, in consequence of its removal to a part in which the supply of arterial blood was greatly increased, had grown to an unnatural size, and hung down in crescentic shape, presenting a very singular appearance.

Mr. Martin brought before the Meeting a collection of Snakes procured by the Euphrates Expedition, which, at the request of the Chairman, he proceeded to notice in detail.

The first, he observed, appeared to be referable to the *Coluber Cliffordii*; it agreed in every respect with specimens of that snake from Trebizond, procured by Keith Abbott, Esq., except that its colours were more obscure. Of this species there were several specimens, young and adult.

The others he regarded as new, and described them as follows:

Coluber Chesneii. This species is allied to *Col. Hippocrepis,* but differs in the shape of the muzzle, (which is more acute,) in the figure and extent of the nasal and labial plates, and in the disposition of the markings.

The labial plates are small and numerous, and in one specimen several are divided.

The posterior frontals are small, and in one specimen are divided into two.

The anterior frontals are contracted.

The superciliary plates are convex;—the eyes are small.

The scales of the trunk are small, imbricate, and without a keel.

The head is pale yellowish brown, the plates beautifully freckled or finely marbled with dark brown: a brown band traverses the superciliary and vertical plates from eye to eye, and then descends on each side obliquely to the angle of the mouth. The labial plates are bordered with dusky brown or deep gray.

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The ground colour of the body above is yellowish brown; a series of square spots of a brown, or olive brown colour, extend from the back of the neck, above the median dorsal line, to the end of the tail. On the sides of the neck begins a line of the same colour, which soon breaks into elongated narrow marks, which towards the middle of the body become confused, broken, and irregular.

The superior margins of the abdominal plates are tinged with gray or dusky brown.

The whole of the under surface of head, body, and tail, pale yellow.

Caudal plates, 69 pairs in one specimen, and 57 in another. Length of head and body, 1 foot 11 inches; of tail, $4\frac{3}{4}$ inches.

Coronella multicincta. Allied to the "Couleuvre à capuchon' but has the muzzle much shorter and rounder; it differs also in the distribution of the colours.

The head is broad, the eyes very small, the muzzle very short and blunt.

The head is gray, finely and closely marbled, and dotted with black; a ring of which colour encircles the neck. The ground colour of the trunk above is pale cinereous gray, barred with transverse marks of black, broadest in the middle, and having a disposition to assume the arrow-head form; they unite with the black of the abdomen alternately, so that their direction across the back is not directly transverse but obliquely so. Length of head and body, 1 foot, $1\frac{1}{2}$ inches; of tail, $2\frac{1}{2}$ inches.

Coronella modesta. Head small; muzzle short, but moderately pointed; eyes small. Scales of upper parts smooth and small; universal colour yellowish gray. A black band passes from eye to eye; a second crosses the *occiput*; and a third of a more decided tint encircles the back of the neck. In a specimen from Trebizond, procured by K. Abbott, Esq., the marks on the head are more obscure. Length of head and body, 9 inches; of tail, $2\frac{1}{2}$ inches.

Coronella pulchra. Head long, flat, and pointed at the muzzle; eyes moderate.

Scales small and smooth.

General ground colour ashy gray; the head above beautifully marbled and mottled with black; an irregular mark crosses each superciliary plate and extends upon the vertical; and a mark of the same character traverses each occipital, and extends upon the sides of the occiput. A black mark runs below the eye to the margin of the lips, and a second to the angle of the mouth; a series of blackish spots begins on the back of the neck, and runs down the back,

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where they become larger, and often broken into a double alternating series; a line of smaller and deeper black spots runs along each side, and the upper margins of the abdominal plates also are irregularly mottled with black. The plates of the abdomen are minutely and obscurely freckled with dusky black. Length of head and body, 1 foot 1½ inch; of tail, 3½ inches.

Vipera Euphratica. Allied to *Vipera elegans*, but differs in the disposition of the plates around and between the nostrils, and in the style of its colouring. A large *fossa* indicates, as in *Vip. elegans*, the aperture of the nostrils, and within this a valve, only to be seen when the *fossa* is opened, stretches obliquely across, forming the posterior margin of the nasal canal, as it extends from the bottom of the *fossa*.

The rostral plate is large and rounded above; the muzzle is large and swollen; the eyes sunk, but are not overshadowed, as in *V. elegans*, by a single superciliary plate; the scales, however, which occupy its place, are somewhat larger than those covering the top of the skull between the eyes. A large elongated scale intervenes between the nasal cavity and the rostral plate. The scales between the nostrils are larger than those which succeed them; the labials are rather small, the fourth from the rostral being the largest—their number on each side is ten. The scales on the top of the head are small, keeled, subacute at the points; those of the trunk are large, flat, elongated, with rounded points, and narrowly keeled.

Subcaudal plates 47 pairs.

Body stout and robust, gradually tapering to the *apex* of the tail. The general colour of the upper surface is brownish gray, minutely freckled with black, the dots of which are more clustered on the sides, in some places, and at regular intervals, giving the appearance of obscure clouded *fasciæ*, or *nebulæ*. The plates of the under surface are pale yellow, obscurely mottled and dotted with dusky gray. Length of head and body, 4 feet 5 inches; of tail, 7¼ inches.

Two other snakes, one from India, the other from Antigua, were also described as follows:

Coluber Cantori. Eyes large; head broad; muzzle moderate; vertical plate broad, as are also the two occipital plates, and the anterior ocular on each side. Scales of body small, smooth, and closely imbricate.

Body deep, somewhat compressed and tapering.

General colour of upper surface glossy brownish black; a black spot below each eye, on the meeting edges of the 5th and 6th labial plates; a black line from the back of the eye to the angle of the

where they become larger, and often broken into a double alternating series; a line of smaller and deeper black spots runs along each side, and the upper margins of the abdominal plates also are irregularly mottled with black. The plates of the abdomen are minutely and obscurely freckled with dusky black. Length of head and body, 1 foot 1½ inch; of tail, 3½ inches.

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The rostral plate is large and rounded above; the muzzle is large and swollen; the eyes sunk, but are not overshadowed, as in *V. elegans*, by a single superciliary plate; the scales, however, which occupy its place, are somewhat larger than those covering the top of the skull between the eyes. A large elongated scale intervenes between the nasal cavity and the rostral plate. The scales between the nostrils are larger than those which succeed them; the labials are rather small, the fourth from the rostral being the largest—their number on each side is ten. The scales on the top of the head are small, keeled, subacute at the points; those of the trunk are large, flat, elongated, with rounded points, and narrowly keeled.

Subcaudal plates 47 pairs.

Body stout and robust, gradually tapering to the *apex* of the tail. The general colour of the upper surface is brownish gray, minutely freckled with black, the dots of which are more clustered on the sides, in some places, and at regular intervals, giving the appearance of obscure clouded *fasciæ*, or *nebulæ*. The plates of the under surface are pale yellow, obscurely mottled and dotted with dusky gray. Length of head and body, 4 feet 5 inches; of tail, 7¼ inches.

Two other snakes, one from India, the other from Antigua, were also described as follows:

Coluber Cantori. Eyes large; head broad; muzzle moderate; vertical plate broad, as are also the two occipital plates, and the anterior ocular on each side. Scales of body small, smooth, and closely imbricate.

Body deep, somewhat compressed and tapering.

General colour of upper surface glossy brownish black; a black spot below each eye, on the meeting edges of the 5th and 6th labial plates; a black line from the back of the eye to the angle of the

where they become larger, and often broken into a double alternating series; a line of smaller and deeper black spots runs along each side, and the upper margins of the abdominal plates also are irregularly mottled with black. The plates of the abdomen are minutely and obscurely freckled with dusky black. Length of head and body, 1 foot 1½ inch; of tail, 3½ inches.

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mouth, and a black band from the side of each occipital plate to the sides of the neck, where it ends abruptly.

Along the sides, for the anterior half of the body, a small whitish spot occurs at regular intervals, with a broad black spot below it; these marks become fainter and fainter, and at length disappear. The central line of the back, from the neck to the middle of the body, pale brown.

Abdomen yellowish white, becoming dusky as it proceeds; the posterior portion and the under surface of the tail being a little paler than the ground colour of the upper surface. Length of head and body, 1 foot 1 inch; of tail, $3\frac{1}{2}$ inches.

Mr. Martin observed, that Dr. Cantor, in honor of whom he named this Snake, had observed it in India; and, according to the observations of this gentleman, it did not attain much larger dimensions than those of the specimen exhibited.

Inhabits India.

The exact locality of the specimen exhibited unknown.

HERPETODRYAS PUNCTIFER. Head narrow, scarcely distinct from the body; muzzle short and pointed; eyes small; body stout and gradually tapering. Scales smooth, short, broad, and imbricate.

General colour pale brown. A dark brown line runs down the top of the head; a riband of dark brown, made up of diamond-shaped marks joined together, commences at the occiput, and runs down the middle of the back to the end of the tail, on which last it is a simple line; a brown riband, little darker than the ground colour, but narrowly margined with dark brown, begins behind each eye, but soon loses itself on the sides of the body. Every scale at its *apex* has two minute dots of chalk-white, which, if not examined through a lens, might lead to the idea of their being the indications of pores; they are, however, simply round little dots of opake white. Plates of abdomen pale yellowish white, irregularly and obscurely marked with a dusky tint.

The specific term *punctifer* is given in allusion to the two white points at the apex of each scale.

Inhabits Antigua.

GEOLOGICAL SOCIETY.

Dec. 9, 1838.—A paper on the "Phascolotherium," being the second part of the "Description of the Remains of Marsupial Mammalia from the Stonesfield Slate," by Richard Owen, Esq., F.G.S., was read.

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mouth, and a black band from the side of each occipital plate to the sides of the neck, where it ends abruptly.

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"Thylacotherium," described in the first part of the memoir*, and which he conceives fully prove the mammiferous nature of that fossil. He stated, that the remains of the split condyles in the specimen demonstrate their original convex form, which is diametrically opposite to that which characterizes the same part in all reptiles and all ovipara;—that the size, figure and position of the coronoid process are such as were never yet witnessed in any except a zoophagous mammal endowed with a temporal muscle sufficiently developed to demand so extensive an attachment for working a powerful carnivorous jaw;—that the teeth, composed of dense ivory with crowns covered with a thick coat of enamel, are every where distinct from the substance of the jaw, but have two fangs deeply imbedded in it;—that these teeth, which belong to the molar series, are of two kinds; the hinder being bristled with five cusps, four of which are placed in pairs transversely across the crown of the teeth, and the anterior or false molars, having a different form, and only two or three cusps—characters never yet found united in the teeth of any other than a zoophagous mammiferous quadruped;—that the general form of the jaw corresponds with the preceding more essential indications of its mammiferous nature. Fully impressed with the value of these characters, as determining the class to which the fossils belonged, Mr. Owen stated, that he had sought in the next place for secondary characters which might reveal the group of mammalia to which the remains could be assigned, and that he had found in the modification of the angle of the jaw, combined with the form, structure and proportions of the teeth, sufficient evidence to induce him to believe, that the *Thylacotherium* was a marsupial quadruped.

Mr. Owen then recapitulated the objections against the mammiferous nature of the *Thylacotherian* jaws from their supposed imperfect state; and repeated his former assertion, that they are in a condition to enable these characters to be fully ascertained: he next reviewed, first the differences of opinion with respect to the actual structure of the jaw; and, secondly, to the interpretation of admitted appearances.

1. As respects the structure.—It has been asserted that the jaws must belong to cold-blooded vertebrata, because the articular surface is in the form of an entering angle; to which Mr. Owen replies, that the articular surface is supported on a convex condyle, which is met with in no other class of vertebrata except in the mammalia. Again, it is asserted, that the teeth are all of an uni-

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2. With respect to the argument founded on an interpretation of structure, which really exists, the author showed, that the *Thylacotherium*, having eleven molars on each side of the lower jaw is no objection to its mammiferous nature, because among the placental carnivora, the *Canis Megalotis* has constantly one more grinder on each side of the lower jaw than the usual number; because the *Chrysochlore* among the *Insectivora* has also eight instead of seven molars in each ramus of the lower jaw; and the *Myrmecobius*, among the Marsupialia, has nine molars on each side of the lower jaw; and because some of the insectivorous *Armadillos* and zoophagous *Cetacea* offer still more numerous and reptile-like teeth, with all the true and essential characters of the mammiferous class. The objection to the false molars having two fangs, Mr. Owen showed was futile, as the greater number of the spurious molars in every genus of the placental *feræ* have two fangs, and the whole of them in the Marsupialia. If the ascending ramus in the Stonesfield jaws had been absent, and with it the evidence of their mammiferous nature afforded by the condyloid, coronoid and angular processes, Mr. Owen stated, that he conceived the teeth alone would have given sufficient proof, especially in their double fangs, that the fossils do belong to the highest class of animals.

In reply to the objections founded on the double fangs of the *Basilosaurus*, Mr. Owen said, that the characters of that fossil not having been fully given, it is doubtful to what class the animal belonged; and, in answer to the opinion, that certain sharks have double fangs, he explained, that the widely bifurcate basis supporting the tooth of the shark, is no part of the actual tooth, but true bone, and ossified parts of the jaw itself, to which the tooth is anchylosed at one part, and the ligaments of connexion attached at the other. The form, depth and position of the sockets of the teeth in the *Thylacothere* are precisely similar to those in the small opossums. The colour of the fossils, Mr. Owen said, could be no objection to those acquainted with the diversity in this respect, which obtains in the fossil remains of Mammalia. Lastly, with respect to the *Thylacothere*, the author stated, that the only trace of compound structure is a mere vascular groove running along its lower margin, and that a similar structure is present in the corresponding part of the lower jaw of some species of opossum, of the *Wombat*, of the *Balæna antarctica*, and of the *Myrmecobius*, though the groove does

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2. With respect to the argument founded on an interpretation of structure, which really exists, the author showed, that the *Thylacotherium*, having eleven molars on each side of the lower jaw is no objection to its mammiferous nature, because among the placental carnivora, the *Canis Megalotis* has constantly one more grinder on each side of the lower jaw than the usual number; because the *Chrysochlore* among the *Insectivora* has also eight instead of seven molars in each ramus of the lower jaw; and the *Myrmecobius*, among the Marsupialia, has nine molars on each side of the lower jaw; and because some of the insectivorous *Armadillos* and zoophagous *Cetacea* offer still more numerous and reptile-like teeth, with all the true and essential characters of the mammiferous class. The objection to the false molars having two fangs, Mr. Owen showed was futile, as the greater number of the spurious molars in every genus of the placental *feræ* have two fangs, and the whole of them in the Marsupialia. If the ascending ramus in the Stonesfield jaws had been absent, and with it the evidence of their mammiferous nature afforded by the condyloid, coronoid and angular processes, Mr. Owen stated, that he conceived the teeth alone would have given sufficient proof, especially in their double fangs, that the fossils do belong to the highest class of animals.

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artery, and that the author possesses the jaw of a *Didelphys Virginiana* which exhibits a similar groove in the same place. Moreover, this groove in the *Phascolothere* does not occupy the same relative position as any of the contiguous margins of the opercular and dentary pieces of a reptile's jaw. The other impression in the jaw of the *Phascolotherium* is a deep groove continued from the anterior extremity of the fractured base of the inflected angle obliquely downwards to the broken surface of the anterior part of the jaw. Whether this line be due to a vascular impression, or an accidental fracture, is doubtful; but as the lower jaw of the *Wombat* presents an impression in the precisely corresponding situation, and which is undoubtedly due to the presence of an artery, Mr. Owen conceives that this impression is also natural in the *Phascolothere*, but equally unconnected with a compound structure of the jaw; for there is not any suture in the compound jaw of a reptile which occupies a corresponding situation.

The most numerous, the most characteristic, and the best marked sutures in the compound jaws of a reptile, are those which define the limits of the coronoid, articular, angular, and surangular pieces, and which are chiefly conspicuous on the inner side of the posterior part of the jaw. Now the corresponding surface of the jaw of the *Phascolothere* is entire; yet the smallest trace of sutures, or of any indication that the coronoid or articular processes were distinct pieces, cannot be detected; these processes are clearly and indisputably continuous, and confluent with the rest of the ramus of the jaw. So that where sutures ought to be visible, if the jaw of the *Phascolothere* were composite, there are none; and the hypothetical sutures that are apparent do not agree in position with any of the real sutures of an oviparous compound jaw.

Lastly, with reference to the philosophy of pronouncing judgment on the saurian nature of the Stonesfield fossils from the appearance of sutures, Mr. Owen offered one remark, the justness of which, he said would be obvious alike to those who were, and to those who were not, conversant with comparative anatomy. The accumulative evidence of the true nature of the Stonesfield fossils, afforded by the shape of the condyle, coronoid process, angle of the jaw, different kinds of teeth, shape of their crowns, double fangs, implantation in sockets,—the appearance, he repeated, presented by these important particulars cannot be due to accident; while those which favour the evidence of the compound structure of the jaw may arise from accidental circumstances.

artery, and that the author possesses the jaw of a *Didelphys Virginiana* which exhibits a similar groove in the same place. Moreover, this groove in the *Phascolothere* does not occupy the same relative position as any of the contiguous margins of the opercular and dentary pieces of a reptile's jaw. The other impression in the jaw of the *Phascolotherium* is a deep groove continued from the anterior extremity of the fractured base of the inflected angle obliquely downwards to the broken surface of the anterior part of the jaw. Whether this line be due to a vascular impression, or an accidental fracture, is doubtful; but as the lower jaw of the *Wombat* presents an impression in the precisely corresponding situation, and which is undoubtedly due to the presence of an artery, Mr. Owen conceives that this impression is also natural in the *Phascolothere*, but equally unconnected with a compound structure of the jaw; for there is not any suture in the compound jaw of a reptile which occupies a corresponding situation.

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Among the parts of the Basilosaurus brought to England by Dr. Harlan, are two portions of bone belonging to the upper jaw; the larger of them contains three teeth; the other, the sockets of two teeth. In the larger specimen, the crowns of the teeth are more or less perfect, and they are compressed and conical, but with an obtuse apex. The longitudinal diameter of the middle, and most perfect one, is three inches, the transverse diameter one inch two lines, and the height above the alveolar process two inches and a half. The crown is transversely contracted in the middle, giving its horizontal section an hour-glass form; and the opposite wide longitudinal grooves which produce this shape, becoming deeper as the crown approaches the socket, at length meet and divide the root of the tooth into two separate fangs. The two teeth in the fore part of the jaw are smaller than the hinder tooth, and the anterior one appears to be of a simpler structure.

A worn-down tooth contained in another portion of jaw, Mr. Owen had sliced, and it presented the same hour-glass form, the crown being divided into two irregular, rounded lobes joined by a narrow isthmus or neck. The anterior lobe is placed obliquely, but the posterior parallel with the axis of the jaw. The isthmus increases in length as the tooth descends in the socket until the isthmus finally disappears, and the two portions of the tooth take on the character of separate fangs.

The sockets in the anterior fragment of the upper jaw are indistinct

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and filled with hard calcareous matter, but a transverse horizontal section of the alveolar margin proves, that these sockets are single, and that the teeth lodged therein had single fangs. This fragment of the lower jaw thus confirms the evidence afforded by the fragments of the upper jaw, that the teeth in the Basilosaurus were of two kinds, the anterior being smaller and simpler in form and further from each other than those behind.

Mr. Owen then proceeds to compare the Basilosaurus with those animals which have their teeth lodged in distinct sockets, as the Sphyræna, and its congeners among fishes, the Plesiosauroid and Crocodilean Sauria, and the class Mammalia; but as there is no instance of either fish or reptile having teeth implanted by two fangs in a double socket, he commences his comparison of the Basilosaurus with those Mammalia which most nearly resemble the fossil in other respects. Among the zoophagous Cetacea the teeth are always similar as to form and structure, and are invariably implanted in the socket by a broad and simple basis, and they never have two fangs. Among the herbivorous Cetacea however, the structure, form, number and mode of implantation of the teeth differ considerably. In the Manatee, the molars have two long and separate fangs lodged in deep sockets, and the anterior teeth, when worn down, present a form of the crown similar to that of the Basilosaurus, but the opposite indentations are not so deep; and the entire grinding surface of the molars of the Manatee differs considerably from those of the Basilosaurus, the anterior supporting two transverse conical ridges, and the posterior three. The Dugong resembles more nearly the fossil in its molar teeth; the anterior ones being smaller and simpler than the posterior, and the complication of the latter being due to exactly the same kind of modification as in the Basiloraurus, viz. a transverse constriction of the crown. The posterior molar has its longitudinal diameter increased, and its transverse section approaches to the hour-glass figure, produced by opposite grooves. There is in this tooth also a tendency to the formation of a double fang, and the establishment of two centres of radiation for the calcigerous tubes of the ivory, but the double fang is probably never completed. The teeth in the Dugong moreover are not scattered as in the Basilosaurus.

Mr. Owen then briefly compared the teeth of the fossil with those of the Saurians, and stated that he had not found a single instance of agreement in the Basilosaurus with the known dental peculiarities of that class. From the Mosasaurus the teeth of the American fossil differ in being implanted freely in sockets and

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In consequence however of the Basilosaurus having been regarded as affording an exceptional example among Reptilia of teeth having two fangs, though contrary to all analogy, and as the other characters stated above may be considered by the same anatomists to be only exceptions, Mr. Owen procured sections of the teeth for microscopic examination of their intimate structure and for comparing it with that of the teeth of other animals.

In the Sphyræna and allied fossil fishes which are implanted in sockets, the teeth are characterized by a continuation of medullary canals, arranged in a beautifully reticulated manner, extending through the entire substance of the tooth, and affording innumerable centres of radiation to extremely fine calcigerous tubes.

In the Ichthyosaurus and Crocodile the pulp cavity is simple and central, as in Mammalia, and the calcigerous tubuli radiate from this centre to every part of the circumference of the tooth, to which they are generally at right angles. The crown of the tooth in these Saurians is covered with enamel, while that part of the tooth which is in the alveolus is surrounded with a thick layer of cortical substance. In the Dolphins which have simple conical teeth like the higher reptiles, the crown is also covered with enamel and the base with cæmentum. But in the Cachalot and Dugong the whole of the teeth is covered with cæmentum. In the Dugong this external layer presents the same characteristic radiated purkingian corpuscles or cells as in the cæmentum of the human teeth, and those of other animals ; but the cæmentum of the Dugong differs from that of the Pachyderms and Ruminants in being traversed by numerous calcigerous tubes, the corpuscles or cells being scattered in the interstices

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In consequence however of the Basilosaurus having been regarded as affording an exceptional example among Reptilia of teeth having two fangs, though contrary to all analogy, and as the other characters stated above may be considered by the same anatomists to be only exceptions, Mr. Owen procured sections of the teeth for microscopic examination of their intimate structure and for comparing it with that of the teeth of other animals.

In the Sphyræna and allied fossil fishes which are implanted in sockets, the teeth are characterized by a continuation of medullary canals, arranged in a beautifully reticulated manner, extending through the entire substance of the tooth, and affording innumerable centres of radiation to extremely fine calcigerous tubes.

In the Ichthyosaurus and Crocodile the pulp cavity is simple and central, as in Mammalia, and the calcigerous tubuli radiate from this centre to every part of the circumference of the tooth, to which they are generally at right angles. The crown of the tooth in these Saurians is covered with enamel, while that part of the tooth which is in the alveolus is surrounded with a thick layer of cortical substance. In the Dolphins which have simple conical teeth like the higher reptiles, the crown is also covered with enamel and the base with cæmentum. But in the Cachalot and Dugong the whole of the teeth is covered with cæmentum. In the Dugong this external layer presents the same characteristic radiated purkingian corpuscles or cells as in the cæmentum of the human teeth, and those of other animals ; but the cæmentum of the Dugong differs from that of the Pachyderms and Ruminants in being traversed by numerous calcigerous tubes, the corpuscles or cells being scattered in the interstices

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of these tubes. Now the crowns of the teeth of the Basilosaurus evidently exhibit in many parts a thin investing layer of a substance distinct from the body or ivory of the tooth, and the microscopic examination of a thin layer of this substance proves it to possess the same characters as the cæmentum of the crown of the tooth of the Dugong. The entire substance of the ivory of the teeth consists of fine calcigerous tubes radiating from the centres of the two lobes, without any intermixture of coarser medullary tubes which characterize the teeth of the Iguanodon; or the slightest trace of the reticulated canals, which distinguish the texture of the teeth of the Sphyræna and its congeners. The calcigerous tubes undulate regularly, and also communicate with numerous minute cells arranged in concentric lines.

Thus, the microscopic characters of the texture of the teeth of the great Basilosaurus are strictly of a mammiferous nature, and confirm the inference respecting the position of the fossil in the natural system drawn from the external aspect of the teeth.

Mr. Owen then adduced further proofs of the mammiferous and cetaceous character of the Basilosaurus, from the structure of the vertebræ, from the great capacity of the canal for the spinal chord, and from the form and position of the transverse processes, which however present a greater vertical thickness than in the true Cetacea, and approach in this respect to the vertebræ of the Dugong.

With respect to the other bones of the Basilosaurus, Mr. Owen stated, that the ribs in their excentric laminated structure are peculiar, and unlike those of any Mammal or Saurian. The hollow structure of the lower jaw of the Basilosaurus, which has been advanced as a proof of its saurian nature, Mr. Owen showed occurs also in the lower jaw of the Cachalot, and is therefore equally good for the cetaceous character of the fossil.

In the compressed shaft of the humerus, and its proportion to the vertebræ, the Basilosaurus again approximates to the true Cetacea, as much as it recedes from the Enaliosaurians; but in the expansion of the distal extremity and the form of the articular surface, this humerus stands alone; and no one can contemplate the comparative feebleness of this, the principal bone of the anterior extremity, without agreeing with Dr. Harlan, that the tail must have been the main organ of locomotion.

Mr. Owen proposes to substitute for the name of Basilosaurus that of Zeuglodon, suggested by the form of the posterior molars, which resemble two teeth tied or yoked together.

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